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AUTHOR Wilhite, Stephen C.
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ABSTRACT

A study was conducted to assess the possible effects of headings on the search and recall performance of high- and low-knowledge subjects, 153 college students in an introductory psychology course. Seventy-five of the subjects read a 1,760-word adaptation of the passage on organizational processes in memory--the low-knowledge passage. The other 78 subjects read a 1,760-word passage on human sexuality--the high-knowledge passage. Each passage was divided into eight sections by the inclusion of embedded headings, each consisting of a word or short phrase. For each section of each passage, one short-answer question quizzing high-level, main-idea information and one short-answer question quizzing low-level, detail information were generated. Approximately half of the subjects in each passage condition read the passage in booklet format with the headings present, and the remainder of the subjects read the passage with headings absent. Subjects answered questions on one test by consulting the text, and then in a second test based only on memory. Results indicated that headings can positively affect the performance of low-knowledge subjects as they search text for answers to questions. The score in the headings-present condition was significantly higher than the score in the headings-absent condition for the low-knowledge passage, but the score in the headings-absent condition was significantly higher than the score in the headings-present condition for the high-knowledge passage. (Three tables of data are included.) (MG)

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HEADINGS AND PRIOR KNOWLEDGE IN THE SEARCH AND RECALL OF TEXT

Stephen C. Wilhite
Widener University

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HEADINGS AND PRIOR KNOWLEDGE IN THE SEARCH AND RECALL OF TEXT

Problem and Conceptual Framework

In two recent studies, Wilhite (1988, in press) has reported results suggesting that the beneficial effects of headings on recognition memory for textual information are limited to those subjects who possess relatively high levels of prior knowledge about the topic of the passage. However, the only type of performance measured in Wilhite's studies was recognition memory as reflected in the ability to answer multiple-choice questions about the passage.

Hartley and his colleagues (e.g., Hartley & Trueman, 1985) have found in a number of studies that headings facilitate searching a text for answers to questions. Thus, it is certainly possible that even low pre-existing knowledge readers would benefit from the inclusion of headings in performing such a search task in which the need to rely on prior knowledge would be minimized. On the other hand, if headings do actually influence the organizational processes of readers, then the differential effect of the headings on subjects with different levels of pre-existing knowledge found in Wilhite's studies should be even more evident in recall tests of memory in which organizational factors are usually more important. The present study was designed to assess these possible effects of headings on the search and recall performance of high- and low-knowledge subjects.

Methodology

A total of 153 college student subjects participated in the experiment as part of an introductory psychology course requirement. Seventy-five of the subjects read a 1,760 word adaptation of the passage on organizational processes in memory employed in Wilhite's (in press) study. The other 78 subjects read the 1,760 word passage on human sexuality employed in Wilhite's (1988) study. Based on the subjects' past experience, the memory passage was defined as the low-knowledge passage, and the sex passage was defined as the high-knowledge passage. The reading level of the two passages was similar based on the Raygor (1979) Readability Index. Each of the

passages was divided into 8 sections by the inclusion of embedded headings which consisted of a word or short phrase describing the main topic of the following material. For each section of each passage, one short-answer question quizzing high-level, main-idea information and one short-answer question quizzing low-level, detail information were generated. Approximately half of the subjects in each passage condition read the passage in booklet format with the headings present, and the remainder of the subjects in each passage condition read the passage with headings absent. Subjects were given 20 minutes to read and study the passage in preparation for answering questions about the passage later. At the end of the 20-minute study period, subjects received a booklet containing the eight detail short-answer questions for the passage read. They were instructed to search the passage for the answer to each question and to record their answer beneath each question. Accuracy and speed in answering the questions were stressed, and the amount of time taken to answer the eight questions was measured. Subjects were told to consult the text in answering the questions.

After completing the Concept Mastery Test (Terman, 1973), subjects received a final booklet containing the eight main-idea short-answer questions for the passage read. Subjects were instructed to answer each question based on their memory for the passage. Subjects' answers to each lookback question and to each retention-test question were assigned a score of 0, 1, or 2, depending on how accurately the response captured the gist of the answer contained in the text.

Results

Separate 2 X 2 factorial analyses of covariance were performed on the response times to the lookback questions, the scores on the lookback questions, and the scores on the retention test questions. The two independent variables in all three analyses were passage (high- and low-knowledge) and heading condition (present and absent). In the analysis of response times, the covariate was the score on the Concept Mastery Test. The means from this analysis are shown in Table 1. The effect of passage was

signficant, $F(1, 148) = 111.23$, $p < .001$, with the answering of the lookback questions taking signficantly longer for the low-knowledge than for the high-knowledge passage. However, neither the effect of heading condition nor the interaction of passage and heading condition approached significance, both with $F(1, 148) < 1$.

In the analysis of scores on the lookback questions, the covariates were the score on the Concept Mastery Test and the time taken to answer the lookback questions. The effect of passage was again significant, $F(1, 147) = 24.23$, $p < .001$, with the score on the questions from the high-knowledge passage significantly higher than the score on the questions from the low-knowledge passage. The means from this analysis are shown in Table 2. The effect of heading condition was not significant, $F(1, 147) < 1$, but the interaction of passage and heading condition was significant, $F(1, 147) = 10.65$, $p = .001$. By Tukey's test, the score in the headings-present condition was significantly higher than the score in the headings-absent condition for the low-knowledge passage, but the score in the headings-absent condition was significantly higher than the score in the headings-present condition for the high-knowledge passage.

In the analysis of scores on the retention test questions, the covariates were Concept Mastery score, time to answer the lookback questions, and score on the lookback questions. The effect of passage was again significant, $F(1, 146) = 55.29$, $p < .001$, with higher scores on high-knowledge passage questions. The effect of heading condition was not significant, $F(1, 146) < 1$, and the interaction of passage and heading condition failed to reach conventional level of significance, $F(1, 146) = 2.80$, $p = .096$. The means from this analysis are shown in Table 3.

Conclusions and Implications

Thus, the results of this experiment demonstrate that headings can positively affect the performance of low-knowledge subjects as they search text for answers to questions. Such findings highlight the importance of the nature of the text processing task in predicting the differential effect of headings on high- and low-knowledge

subjects. The finding that subjects processing the high-knowledge passage actually answered the lookback questions better in the headings-absent condition than in the headings-present condition was unexpected. This result cannot be explained in terms of differences in the adequacy of the headings for the two passages. Ratings by an independent group of subjects revealed that the headings for the sex passage were judged just as adequate in reflecting the main topic of their associated passage segments as were the headings for the memory passage. In addition, independent raters judged the lookback questions for the sex passage to have just as much conceptual overlap with their associated headings as the lookback questions for the memory passage have with their headings.

Contrary to prediction, headings were not found to facilitate the answering of short-answer retention questions to a greater extent for the high-knowledge than for the low-knowledge passage, although the results were in the predicted direction. This failure to find a facilitative effect for headings on retrieval of information from the high-knowledge passage may have been the result of answering the lookback questions. A multiple regression analysis of the retention test data from the present experiment revealed a significant relationship between performance on the lookback questions and performance on the retention questions even when the variable of score on the lookback questions was entered after the variables of passage and Concept Mastery score, $\underline{B} = .37$, $\underline{t}(148) = 4.23$, $\underline{p} < .001$. Thus, the process of answering the lookback adjunct questions may have overshadowed any beneficial effect of headings on the retrieval from memory of encoded passage information.

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Table 1

Mean Time in Minutes to Answer the Lookback Questions

Passage	Heading condition: Present	Heading condition: Absent
High-knowledge		
M	13.16	13.48
SD	3.29	3.37
n	38	37
Low-knowledge		
M	20.56	19.73
SD	4.40	4.63
n	40	38

Table 2

Mean Score[a] on the Lookback Questions

Passage	Heading condition: Present	Heading condition: Absent
High-knowledge		
M	13.51	14.59
SD	2.29	1.51
n	38	37
Low-knowledge		
M	12.24	10.65
SD	2.38	3.52
n	40	38

Table 3

Mean Score[b] on the Retention Test Questions

Passage	Heading condition: Present	Heading condition: Absent
High-knowledge		
M	9.74	9.06
SD	3.12	2.78
n	38	37
Low-knowledge		
M	4.37	5.24
SD	3.32	3.40
n	40	38

Note: The means shown are adjusted for the effect of the covariate(s).

[a]Maximum possible score = 16. [b]Maximum possible score = 16.